



# Alfalfa Stand Establishment

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The objective of alfalfa stand establishment is to obtain about 30 vigorously growing seedlings per square foot before extreme weather conditions prevail. Good planning, along with some "art" and "good farming" practices are critical to reliable stand establishment. Although the exact steps required for successful stand establishment vary from farm to farm and from year to year, there are 12 **Keys** included in the Alfalfa Establishment Checklist. Each **Key** is briefly discussed to answer frequent questions. In several cases, important cost factors are highlighted. A discussion of several "Special Circumstances" related to alfalfa stand establishment follows the checklist discussion.

## Alfalfa Establishment Checklist:

**Site Selection** - Choose a deep, fertile, well-drained soil.

**Soil Test** - Apply fertilizer and lime according to a reliable soil analysis.

**Land Preparation** - Plow, level, and drain low areas well before sowing.

**Seedbed Refinement** - Develop a level, mellow, firm bed with small clods.

**Variety Choice** - Select adapted, pest-resistant varieties.

**Seed Quality** - Use weed-free, clean seed with good germination.

**Planting Date** - Sow during Aug. 15 to Sept. 15 or March 15 to April 15.

**Seed Placement** - Cover seeds with  $\frac{1}{2}$ " soil and press.

**Sowing Rate** - Plant 10-12 pounds per acre of good seed.

**Planting Equipment** - Calibrate and adjust planters to place seed in a good environment.

**Seed Inoculation** - Use rhizobium bacteria, specific for alfalfa.

**Pest Control** - Control weeds, insects, and diseases.

## Site Selection

Stand productivity and longevity are best on deep, fertile, well-drained loamy or sandy loam soils. Productive alfalfa stands require soils with adequate infiltration, yet sufficient clay and organic matter to hold moisture. Soil with good water-holding capacity is important because high alfalfa yields require large quantities of water (approx. six inches of available water for each ton of hay).

Alfalfa roots can penetrate 25 feet in deep soils, and high yield and long stand life are attainable in sub-irrigated fields

— those with a water table between 5 feet and 20 feet deep. If the water table rises to the surface during warm seasons, alfalfa grows poorly and may even die within a few days from "scald". "Scald" often kills alfalfa plants when water stands during bright sunny days. Oxygen is not available to roots and the water holds in heat. "Scald" usually occurs in thin stands or just after harvest when foliage does not shade the soil. This differs from root rot in that there is no pathogen involvement and no genetic resistance is available.

Waterlogged soils have poor aeration, inhibit nitrogen fixation, and encourage certain root rot diseases. Several adapted varieties are available with root rot resistance. They perform better in wet soils than susceptible varieties but cannot tolerate extended periods of standing water.

Much of the alfalfa in the state grows along creek and river bottoms that do not flood for prolonged periods of time. These alluvial soils are usually deep, drainage can be provided, and fertility problems (if they exist) can be corrected profitably. Alfalfa will grow on shallow soils, but growth is usually reduced by rapid depletion of water in shallow root zones; thus, overall production will be less and stand longevity will be shorter.

**Avoid** using sites that may have herbicide carryover problems. Alfalfa is very sensitive to picloram (sold as Grazon PC and Tordon 22K) and some of the new sulfonyl-urea herbicides such as Ally, Glean, and Amber. Alfalfa is usually **not** listed as a rotational crop for these herbicides. When listed, there is a 22 to 34 month minimum rotational interval before alfalfa can be planted. Also, field bioassay with alfalfa must be performed after application of several of these herbicides before alfalfa can be legally planted.

## Soil Test

Commonly overlooked steps in alfalfa production include developing and maintaining proper soil fertility. Nutrient deficiencies and pH (acidity) should be adjusted before preliminary seedbed preparations. Once a site is selected, soil sampling and analysis should occur well in advance of sowing. A year in advance is a good idea. Alfalfa uses phosphorus, calcium, and potassium heavily. Harvesting 5 tons of hay removes approximately 50 pounds of  $P_2O_5$ , 100 pounds of calcium, and 220 pounds of potash per acre. In some soils, these quantities are readily available; whereas, in others, much of this must be applied.

For best results, both lime and fertilizer should be incorporated into the upper six inches of soil before stand establishment, then monitored by soil testing every year. If essential nutrients become deficient, or if the soil becomes excessively acidic, yields decrease and the alfalfa stand life will be shortened. Problems with weeds increase on nutrient-deficient soils because of reduced alfalfa competitiveness. Herbicides can control weeds, but alfalfa yields will still be low due to soil fertility problems.

Lime and phosphate fertilizer are relatively slow to improve soil productivity. If large amounts are required to bring the pH and phosphorous to acceptable levels, they should be applied and incorporated six months to a year prior to sowing alfalfa. Before sowing, apply enough lime to neutralize the soil and enough phosphorous to satisfy the crop's needs for three years. Annual applications of potassium are recommended for deficient soils.

The cost of lime and fertilizer (Table 1) may seem high, but cutting corners on these important factors leaves the other activities in jeopardy. An inexpensive soil test (\$8 per sample) can save producers money by indicating which nutrients are deficient and what quantity should be supplied. This may help avoid the cost of unnecessary fertilizer. If soil analyses indicate the need for more fertilizer and lime than in the high estimate, one should consider another site. Building up the fertility and pH over several years may be recommended.

## Land Preparation

Assuring good surface drainage is critical before establishing alfalfa. General leveling to remove improperly placed dead-furrows and back-furrows should be done several months, or a year, prior to sowing alfalfa. Development of a well-drained field frequently requires several attempts. Observing where water stands between rains is one of the best indicators of drainage problems.

Seedbed preparation begins with the removal of the previous crop and involves many possible combinations of farming equipment. Generally, the normal steps include a primary tillage, disking, leveling, and smoothing.

Primary tillage consists of moldboard plowing, chisel plowing, or deep disking. Many producers believe that plowing at least eight inches deep is essential to bury crop residue and control weeds by burying growing plants and ungerminated seeds. However, OSU researchers have found that a deep disking can be used as a substitute for moldboard or chisel plowing. In soils that develop hardpans, a chisel plow is commonly used to rip through existing hardpan layers.

Shallow disking normally follows primary tillage. Disking breaks up the clods and is a good tool for incorporating residue, lime, and fertilizer. Soil conditions may require disking several times.

## Seedbed Refinement

An ideal seedbed is firm on the surface, but loose enough in the root zone to allow rapid root penetration. Disking is often followed by spring-tooth and spike-tooth harrowing to further break clods and to help smooth the field. The final operation may be a corrugated roller or cultipacker to crush the remaining clods and finish firming the area.

Working down a seedbed should be done when soil contains sufficient moisture so that it crumbles when worked.

There is usually a short time after each rain when soil moisture is just right.

Having moist soil one to three inches below the surface at planting is important; however, moisture at the surface is not important. Most successful alfalfa plantings are made when the seed is planted into dry surface soil. Moisture required for germination and initial seedling growth comes from rain or irrigation after planting. If the soil is dry to a depth of four to six inches, it may take over an inch of rain to wet the soil enough for germination of the alfalfa.

If preplant herbicides are used, they must be applied when the seedbed is fairly fine (no clods greater than  $\frac{1}{2}$  inch) and incorporated with a disk operated about four inches deep. At this depth, the herbicide is uniformly distributed in the top two inches. On the surface of the final seedbed, clods should be no larger than  $\frac{1}{2}$  inch in diameter, yet should not be powdery. A seedbed is sufficiently firm when an entire footprint is visible but sinks no deeper than an inch or if the impression of a tractor tire sinks no deeper than the tread bar.

On certain sites, it may be desirable to maintain a significant amount of crop stubble and debris on the surface. This is especially important with sandy soils that are highly susceptible to wind and water erosion. See "Companion Crops" and "No-till" discussions under the Special Considerations section for more information on these topics.

Table 1 provides good general estimates of costs of establishing a stand. Costs for "Land Preparation" and "Seedbed Refinement" are difficult to clearly separate. Disking or using a spring tooth for seedbed preparation will frequently assist with weed control; thus, the cost is shared between two different activities but assigned to "Seedbed Preparation". Deep tillage is relatively expensive and should not be done as a matter of routine without a specific need. Prior to deep tillage, the upper 10 to 15 inches of the soil profile should be examined for compacted layers. If compacted areas do not exist in this zone, tillage to this depth is usually not necessary.

## Variety Choice

The choice of alfalfa variety is one of the few irreversible management decisions. That choice has a significant effect on hay yields, degree of insect and disease resistance, and stand longevity, all of which affect profits. However, once the seeds are sown, the variety cannot be improved.

Young alfalfa seedlings can fall prey to a host of insects and diseases. Genetic pest resistance, when available in adapted varieties, is the best way to combat these problems. Seedling stands are particularly vulnerable to aphids and root rots during the first few months. These pests can destroy new stands; however, multiple-pest resistant varieties withstand greater numbers of insects (or more disease infestation) without retarded growth or dead plants. In addition to the benefits during stand establishment, genetic resistance also has long-term economic benefits. One or two fewer insecticide applications may be required each year, and decreased pest stress on resistant varieties results in longer stand life.

Several dozen new alfalfa varieties are released every year, and choosing the best ones for a particular area is difficult. Producers should be alert to the performance of new varieties tested in their area and utilize the best. The Extension Service publishes results of such trials every year.

## Seed Quality

Purchasing good alfalfa seed is a good investment. “cheap” seed may have a poor germination, small or shriveled seeds, and a high content of weed seed or trash. All these contribute to stand failures. So, buying “cheap” seed may appear to save a few dollars per acre during establishment but may actually cost thousands of dollars in reduced stand life and yield.

For example, more low quality than high quality seed is necessary to establish a good stand. Ten pounds per acre of high germination, clean seed should be adequate, whereas 20 pounds per acre of low germination seed containing a high percent weed seeds and foreign material may be required.

## Planting Dates

**Fall Sowing:** Alfalfa is traditionally planted in late August and early September in Oklahoma. Fall plantings can be extended into early October if a stand can be irrigated immediately after sowing to obtain emergence. Plants coming up after early October may not have adequate root development to survive the winter. A good rule of thumb is alfalfa plants need five leaves before the first hard freeze (20° F).

A properly prepared seedbed is critical to early establishment. Incorporated preplant herbicide is an option, but use should be limited to areas with severe weed problems since incorporation can be detrimental to a good seedbed (loss of moisture and formation of clods). A better alternative may be to control seedling weeds after they have emerged by applying post-emergence herbicides early in the fall (see pest control).

**Spring Planting:** Spring-sown alfalfa in Oklahoma is more risky than fall plantings. This is primarily due to more problems with strong drying winds, insects, weeds, and intense rains that tend to crust the soil. When spring establishing, planting between mid-March and mid-April is critical. This allows seedlings enough time to develop good root systems prior to the onset of high temperatures (above 90° F). The use of multiple-pest resistant varieties, excellent seedbeds, and preplant incorporated herbicides, are even more important with spring plantings. Spring sowing is more likely to be successful in the eastern half of the state where rainfall is higher. They can be successful statewide if irrigation is used.

Normally only one or two cuttings are possible during the first summer for spring-sown alfalfa stands. Even in subsequent years, yields for spring-sown stands tend to be lower than those established in late summer. It is advisable to consider an annual forage crop to sow in spring and then harvest it in time to plant alfalfa in late summer.

## Seed Placement

Seed depth is critical to germination, seedling emergence, and root development. Ideally, seeds should remain between  $\frac{1}{2}$  and  $\frac{3}{4}$  inch below the soil surface. Seed placed on the surface of a freshly developed firm, mellow seedbed and then pressed with a roller or press wheel gives the best placement. Either a combination drop seeder and tandem packer roller (Brillion seeder, for example) or a grain drill with a small-seeded legume box is the most reliable equipment for sowing alfalfa. If a grain drill is used, it is best to broadcast the seed by disconnecting the drop tubes and placing them

behind the openers and in front of any press wheel. Rolling the site is advisable after planting with a drill.

## Sowing Rate

Ten pounds. per acre of good alfalfa seed is equivalent to approximately 42 seeds per sq. feet, and proper planting of 10 pounds. of pure seed/ac. into a well prepared seedbed will result in stands of 25 to 30 plants/sq. feet Most stands thin naturally during the first year to about 15 to 20 plants/sq. feet Plant density will continue to decline and eventually stabilize at five to eight plants/sq. feet in a full stand.

**Costs** associated with “Variety Choice”, “Seed Quality”, and “Sowing Rate” are closely interrelated and cannot realistically be considered singly. Frequently seed costs are assumed to be the major cost to the producer. The typical establishment cost itemization (Table 1) shows that seed cost is over 40percent of the total if no fertilizer, lime or pesticides are applied and low quality seed is used. On the other hand, it amounts to less than 15percent of the total if these other factors are applied along with high quality seed (12 lb @ \$2.50/lb.). Cheaper seed would reduce the total costs only slightly. For example — one could buy seed for \$1.00/lb. but should increase the sowing rate to 20 pounds/ac. to compensate for inferior quality. The short term savings would be \$10 which may be lost each year in reduced yield.

## Planting Equipment

Placing the correct amount of seed at the proper depth in firm contact with the soil is the prime objective when sowing alfalfa. A good way to reduce the cost of establishing alfalfa is to use only the amount of seed necessary placed in a good environment. This means that equipment must be properly calibrated to apply the correct amount. Planting too little seed increases the risk of stand failure while planting too much seed is expensive and obviously wasteful. High sowing rates are not good substitutes for preparing a fine seedbed. The following are common types of equipment used for successful alfalfa establishment.

**Specialized drills** have a box for small seeds and disk openers with depth bands to accurately place the seed 1/2 to 3/4 inch deep. Packer wheels firm soil over and around seeds. This type of drill is especially good on very firm seedbeds.

**Double corrugated roller seeders** drop the seed between the corrugated rollers. The first roller breaks small clods and firms the seedbed. The second roller splits the ridges made by the first roller, covers the seed, and provides additional firming of the soil. While these are considered the best alfalfa seeders for most conditions, they may leave sand very vulnerable to wind erosion.

**Grain drills**, equipped with small-seed attachments, can accurately meter alfalfa seed. The major problem in using grain drills is controlling seed placement depth. If the furrow created by the drill is too deep, rain can wash soil into the furrow and cover alfalfa seeds too much. Very few seeds left on top of the soil develop into vigorous plants, even under ideal conditions. Allowing seed drop tubes to wave from side to side leaves many seeds on the soil surface. Tubes can be tied so that seeds fall in front of press wheels; otherwise, rolling after the planter in a separate operation helps improve emergence percentages.

**Pneumatic seeders**, mounted on flotation-wheeled vehicles, can sow alfalfa fields rapidly and accurately. Seed is metered from a hopper and carried through tubes along booms (20 to 50 feet long) with air. These machines work well on fluffy dry sandy soils that cannot be firmed by rolling. Seed is blown onto the soil from delivery tubes spaced 6 to 12 inches along the booms. Lightly packing, dragging a chain, or harrowing covers seed. The main advantage to this type seeder is the rapid speed they travel. Producers can sow several acres per minute, which may be important, just before a predicted rain.

**Aerial sowing** onto freshly prepared seedbeds is another method used to sow alfalfa with good success, especially in fluffy seedbeds. Use an aerial applicator experienced in sowing alfalfa. With broadcast planting, two passes in a crossing pattern may be necessary for uniform coverage. Rolling the fields after aerial sowing is advisable.

**No-till or minimum-tillage drills** can do a good job of placing alfalfa seed at the correct depth. When establishing alfalfa on steep slopes or otherwise erosive or shallow soils, this type of drill is best.

When it is impossible to prepare a firm seedbed due to excessively dry conditions, dusting-in the seed is an alternative. The bottom ends of the flexible seed spouts are removed from the drill shanks, and the seed drops on the surface of the shallow furrow. A drag chain may be used to cover the seed with soil. Rainfall then firms the soil.

## Seed Inoculation

Alfalfa roots can convert atmospheric nitrogen into a usable form if the roots have effective nodules. Nodules are the result of an infection by an effective strain of bacteria (*Rhizobium meliloti*).

Alfalfa seed should *always* be inoculated with live rhizobium bacteria, specific for alfalfa. In some fields with a history of alfalfa or sweetclover, alfalfa may not benefit from inoculation, but it is difficult to identify those fields before planting. After emergence, inoculation is risky, difficult, and expensive. Many strains of rhizobia are present in soil, and some may form nodules on alfalfa roots, but not all nodules fix nitrogen. Effective nodules on alfalfa, generally pink to deep red on the inside, can fix several hundred pounds of nitrogen per acre each season.

Legumes can establish and survive without nitrogen-fixing bacteria, but plants cannot fix nitrogen. This means that without added nitrogen, plants will have a yellowish appearance and yields will be low. With a high rate of nitrogen fertilizer application, uninoculated stands can be productive. Since inoculation is easy and cheap, it is probably the best insurance a farmer can buy.

A sticker helps nodule forming bacteria adhere to seed. Commercial preparations of stickers and rhizobium are available from inoculant manufacturers and do an excellent job. Some preparations contain up to 20 times the previously recommended number of bacteria. Closely following manufacturer's instructions, normally produces the best results.

An alternative to commercial stickers is to use milk or a water-based solution containing 10 to 20 percent table syrup or sugar. One pint is sufficient sticker for a bushel of seed. Moisten all seeds (in a concrete mixer, if possible), then add the inoculant. If the mixture is still too moist, add more inoculant, finely ground limestone, or powdery dry soil.

Heat, direct sunlight, and drying are all detrimental to the survival of rhizobia. For this reason, it is important to store inoculant packets in a cool place. Certain brands of alfalfa are pre-inoculated (with or without lime coating). Even with the large amounts of rhizobia initially applied, many bacteria may die during prolonged storage. Expiration dates appear on inoculant packets and pre-inoculated seed bags. The date indicates when most of the bacteria will have died under normal storage conditions. Properly inoculated seed have thousands of bacteria per seed. Only one bacterium is needed to infest a seedling's root. Bacteria on seed in hot soil die a few at a time; nevertheless, even after two or three weeks, there are usually enough live bacteria remaining to be effective.

If there are questions about the viability of bacteria on inoculated seed due to the length of storage and storage conditions, then seed should be reinoculated. Do not use water to moisten lime-coated seed. Fresh inoculant can be applied with mineral oil as a sticker. About 1/2 ounce of mineral oil per pound of seed is sufficient.

Inoculant is normally included with the higher priced seed. Cost for preinoculated seed is about five cents/pound more than comparable raw seed. Inoculant costs less than \$1/acre if applied by the producer.

## Pest Control

**Weeds** in new alfalfa stands are a major concern. They can interfere with the planting operation and compete with seedlings for nutrients, water, and light. They can also reduce forage quality and yield of first-cut hay.

Weed control should begin with site selection. A good site is not severely infested with weeds (even in the fence rows). Perennials should be controlled one or two years before planting alfalfa. Also, annual weeds should not be allowed to produce seed in crops preceding alfalfa.

Preplant incorporated herbicides are a must for *spring-sown* alfalfa, but a postemergence treatment is a better option for *fall-sown* alfalfa. These differences in herbicide approaches relate to differences in weed species and their competitiveness plus differences in environmental conditions in spring and fall. Preplant herbicides control most summer annual weeds but are not as effective on some of the cool-season weeds. Also, the seed reserves of summer weeds are usually high enough to assure competition for soil moisture during the summer; whereas, cool-season weeds are not such a serious problem for most producers.

A disadvantage of preplant treatments is that the incorporation delays seedbed preparation. The loosening and drying associated with the incorporation may result in a marginal seedbed, especially in the fall when soil moisture is limiting.

Most weeds in fall-sown alfalfa emerge at the same time as alfalfa (late September). They remain small and inconspicuous until late winter or spring. Postemergent control is most effective when applied to actively growing plants in October or November.

Herbicides should be applied only if warranted by weed populations. Producers should be sure that costs (Table 1) for chemical weed control will be recouped as increased forage quality and yield at first harvest.

**Insects** begin attacking alfalfa plants at emergence. Frequent scouting of new stands is essential to good insect control. Grasshoppers, armyworms, cutworms, and other general feeders can infest a new stand in a very few days.

Timely application of insecticides is the only reliable method of control. With no-till alfalfa, it is critical that insects such as grasshoppers be controlled before planting. It may be advisable to spray fence lines and field borders, if grasshopper infestations are heavy.

Spotted alfalfa aphids, and occasionally pea aphids, build up during the fall on seedling alfalfa. Blue alfalfa aphids are present nearly every winter and spring. Using adapted resistant varieties and good cultural practices that encourage rapid growth provide the best controls for aphid infestations. Early detection is an important factor because it allows timely insecticide application before problems have gone too far.

**Diseases**, such as damping off and root rots, are sometimes problems with alfalfa stand establishment. Fungicidal treatments, applied to seed or sprayed on seedlings, are effective for a short time and may make the difference between successful stand establishment and failure. Genetic resistance in conjunction with crop rotation, good land preparation practices, and good seedbed preparation are more long-lasting control measures. Root rots are most commonly found in soils that are wet for a prolonged period; therefore, providing drainage before sowing is an excellent disease prevention measure.

## Special Considerations

The following topics are not necessarily part of normal alfalfa stand establishment in Oklahoma. However, they are critical to many individual producers as indicated by the many questions directed to extension and research staff.

### **Question: Will *companion crops* (or *nurse crops*) help with alfalfa stand establishment?**

**Answer:** Only if one can choose companion crops that do not crowd out alfalfa. Sowing a small grain with alfalfa during establishment of alfalfa is not usually recommended under Oklahoma conditions. These crops compete for moisture and light, reduce yields and quality of alfalfa, and can cause stand loss. On sandy soils, a thin stand of grass such as german millet is a good way to protect alfalfa seedlings from wind-driven sand. German millet can be planted (at five pound per acre) before alfalfa or with it. Planting other nonwinter hardy species, such as sorghum sudan or spring oats, three to four feet apart in east-west rows, is another good option. Thin stands of summer weeds can also serve as a companion crop. Because these plants winterkill, they are not competitive with alfalfa during the spring. Turnips are also sown with alfalfa successfully. On the other hand, cool-season weeds such as volunteer wheat, cheat and rescuegrass should be killed by treating with a herbicide in October or November.

A companion crop is not a good practice for spring establishment in Oklahoma. It offers too much competition with alfalfa seedlings, and stand failure can result. For this reason, preplant incorporated herbicides should be used to assure weed competition does not interfere with early alfalfa seedling growth.

### **Question: Does *No-Till* establishment of alfalfa have a place in Oklahoma?**

**Answer:** It is considered very risky to attempt no-till establishment of alfalfa. For this reason, very little no-till is practiced in Oklahoma. No-till requires even more long range planning than conventional establishment. Land shaping for improved drainage must be done prior to establishing the previous crop.

In addition, fertilizer and lime for the alfalfa crop should be applied and incorporated before the previous crop. Application of lime and phosphorous to the soil surface is not as effective; thus, more must be applied.

When sowing alfalfa into existing vegetation, control of weeds and insects are also more difficult. More rain may be required for alfalfa emergence with no-till practices since the existing plants will be using water.

No-till planting of alfalfa into established sod is usually not successful. If alfalfa is sown into fescue or bermudagrass sod, bands of sod must be killed. The bands can be six to eight inches wide and spaced every 20 to 40 inches. Plants can be killed with herbicides or certain minimum-tillage drills. Sowing alfalfa into fescue or bermudagrass sod is also difficult because of problems related to insufficient water. When sowing into sod in the fall, the soil may be dry because of water usage by the grass during summer. Interseeding alfalfa in the spring puts alfalfa seedlings at a disadvantage because of the strong competition with the established grass.

The best results with no-till alfalfa establishment have been into stubble of cool-season annual crops such as wheat. Summer weeds and volunteer wheat plants can be a major problem, and controlling them with herbicides may be excessively expensive. This is especially true with above average summer rainfall. Alfalfa also can be interseeded into german millet stubble if the millet grows for only a few weeks and is harvested for hay just before sowing alfalfa. The millet's fine stems do not interfere with most common alfalfa planters. The short growth period for millet does not dry the soil as many other warm season crops. Millet regrows very little after cutting and offers little competition to alfalfa seedlings.

Our advice is to first do some limited tillage on a relatively small scale. Then, after learning what is involved with pest control, try no-till alfalfa establishment on a limited area.

### **Question: What is the best *crop rotation* for alfalfa?**

**Answer:** Sow alfalfa after cereals. Wheat occupies more acres in Oklahoma than the total of all other cultivated crops; consequently, it is the most common rotational crop for alfalfa. Wheat-Alfalfa-Wheat-Alfalfa makes a good rotation because the crops are compatible. One can be plowed up in time to plant the other within a few months. Also, the array of diseases, insects, and weed pests on wheat and alfalfa are different; thus pest problems are not perpetuated.

It is best to follow alfalfa with a non-leguminous species to take advantage of residual nitrogen left from the alfalfa; however, little nitrogen is released from very thin alfalfa stands that consist primarily of grassy weeds.

Row crops such as corn, grain sorghum, and cotton generally contain few weeds that cause problems in alfalfa. When they are harvested and plowed in the fall, the land can be prepared for sowing alfalfa the following fall. This allows sufficient time to correct pH and fertility problems as well as land shaping to reduce drainage problems. Cultivation during the summer can help control perennial weeds. Soybeans and peanuts (both legumes) are not considered good choices to rotate with alfalfa because of similar pest problems and the loss of opportunity to use residual nitrogen.

### **Question: Can *alfalfa* after *alfalfa* work?**

**Answer:** This is not recommended. It is an unnecessary risk. Alfalfa stands usually dry soil deep in the profile, and several

years are normally required to replenish the soil moisture. In addition, alfalfa following alfalfa invites soil-borne pest problems (weeds, insects, and disease organisms) that build up during an alfalfa stand life.

There is no exact recommended minimum number of years between alfalfa stands in the same field. A good conservative rule of thumb is to leave a field out of alfalfa as long as it was in. At least one other crop should be grown between alfalfa stands.

Alfalfa produces a chemical which is toxic to other alfalfa plants and certain other seedlings. The toxic chemical is water soluble and leaches out of the top layer of soil after a few rains or irrigations. Sometimes this autotoxic material interferes with germination and growth when alfalfa is sown immediately after alfalfa. Occasionally alfalfa follows alfalfa without apparent problems; however, this is the exceptional situation.

**Question: Can an alfalfa stand be *thickened up*?**

**Answer:** Try only on very thin, first-year stands. Attempts to sow alfalfa into old, thin stands usually result in few new seedlings becoming productive plants. Seedlings are more sensitive to pests that have built up, and seedlings must compete with the remaining mature plants for nutrients, water, and light. If an older stand has thinned to the point that it is not economical, the stand should be destroyed and a different species grown before re-establishing alfalfa.

There is a temptation to resow "drowned-out" spots. This is an acceptable practice only if the reasons for the wet spots are corrected. After improving drainage, a good seedbed can be prepared and alfalfa can be established successfully. Trying to fill in the wet spot, without correcting the problem, usually results in another stand failure.

When young (less than one year old) alfalfa stands are thin (fewer than five plants per square feet), overseeding with alfalfa in late summer may be successful. Again, the problem that caused the original poor stand must be corrected. There is little danger of autotoxicity problems in thin stands less than a year old.

**Question: When should *new stands be harvested*?**

**Answer:** Don't abuse young stands by harvesting or grazing too soon after planting. Young alfalfa plants need time to develop extensive root systems. The root system is the primary advantage alfalfa has over most other forages, and

harvesting new stands too early can slow the development of the root system.

It can be tempting to harvest "rabbit hay" from a new stand in the fall or to graze it. Either of these practices can decrease the productivity of the alfalfa stand. The most productive stands of alfalfa are generally sown in the fall and harvested about May 1 of the next year.

One exception would be grazing weedy areas after a killing freeze (lower than 20° F). This could facilitate removal of weedy grasses which may harm alfalfa by shading.

The first flush of spring growth for first-year plants normally does not bloom. When new growth is initiated from crowns, it is time to harvest. If a severe infestation of weeds exists, then the first harvest should be taken when weeds shade out alfalfa seedlings (normally in mid-April, with cheat). After the first cutting, the stand can be treated as most mature stands.

New spring-sown alfalfa stands are normally ready to cut about 8 to 10 weeks after emergence. Harvesting at the first sign of crown bud growth or the appearance of the first flowers is recommended. Cutting earlier than this may weaken the alfalfa plants and leave them less able to compete with weeds during the first summer.

**Question: What are alfalfa stand *establishment costs*?**

**Answer:** The successful establishment of alfalfa is usually expensive. Total costs in Oklahoma vary widely, depending upon needs of individual fields. Cost estimates normally run from less than \$100 per acre to over \$150 per acre. The high overall cost is an important reason to perform all the necessary activities correctly, in a timely fashion. Omitting steps may contribute to stand failure or a poor stand and risk the loss of the other parts of the investment.

Table 1 lists a range of costs for the major activities. Costs for any particular farm may be more or less expensive. The low estimates indicate the least expenditures one could reasonably expect. If one finds that expected costs are similar to the high estimates for nearly all categories, perhaps another site should be considered where fewer inputs are required. Note that these estimates represent those reported for custom work. A farmer conducting a particular activity may want to break the estimate into components of labor, equipment depreciation, interest, etc. Normally, little difference in cost should be noticed.

**Table 1. Alfalfa Establishment Costs Per Acre, Based on Custom Rates.**

<i>Item</i>	<i>Low \$ Estimate</i>	<i>High \$ Estimate</i>	<i>Comments &amp; Conditions</i>
<b>Soil Fertility and pH</b>			
Soil Test	—	—	\$8/sample - negligible
Nitrogen	0	4	20 lb @ \$0.20/lb
Phosphorus	0	18	100 lb @ \$0.18/lb
Potassium	0	10	100 lb @ \$0.10/lb
Lime	0	60	3 tons @ \$20/ton (applied)
Fert. Application	0	5	
<b>Land Preparation</b>			
Deep Tillage	0	12	Moldboard (\$12), Chisel (\$9), Disk (\$6)
Disk to Incorporate Fert.	5	10	Break Clods
Level & Drain	5	15	Depends on needs
<b>Seedbed Preparation</b>			
Shallow Disk (1 time)	5	7	Incl. Weed Control
Spring Tooth (1 time)	4	8	Incl. Weed Control
Spike Harrow (2 times)	4	8	
Cultipacker	0	7	
<b>Seed</b> (Incl. Variety Choice, Seed Quality, Sowing Rate, & Inoculation)	20	30	See discussion
<b>Planting</b>	5	8	
<b>Pest Control</b>			
Herbicide			
Weedy Grasses	0	15	1 post-emerg. appl.
Broadleaf Weeds	0	8	1 post-emerg. appl.
Insecticide	0	8	1 application
Fungicide	0	0	Included with Variety & Seed
Site Selection, Planting Date, & Seed Placement Considerations			No Cost To Producer
<b>TOTAL</b>	<b>\$ 48</b>	<b>\$233</b>	<b>\$80 to \$100 is usual</b>

## **The Oklahoma Cooperative Extension Service**

### ***Bringing the University to You!***

The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of the Cooperative Extension system are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.

Oklahoma State University, in compliance with Title VI and VII of the Civil Rights Act of 1964, Executive Order 11246 as amended, Title IX of the Education Amendments of 1972, Americans with Disabilities Act of 1990, and other federal laws and regulations, does not discriminate on the basis of race, color, national origin, gender, age, religion, disability, or status as a veteran in any of its policies, practices, or procedures. This includes but is not limited to admissions, employment, financial aid, and educational services.

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